Inverse analysis of loess shear strength parameters of Tianshui region

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Inverse analysis of loess shear strength parameters of Tianshui region

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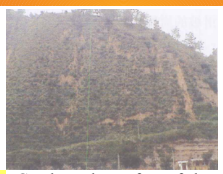
main content

- Critical loess slope
- Investigation in Tianshui region
- Inverse analysis
- Results validation and discussion

1. Critical loess slope

Crack on the top of slope

Fs=1.0

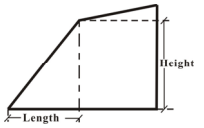


Crush on the surface of slope

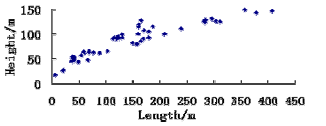
Recovering landslide

Both side of the landslide

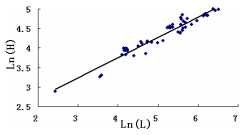
2. Investigation in Tianshui area



Definition of slope Height and Length



54 critical loess slopes based on field investigation



Liner regression equation:

$Ln(H) = 0.52Ln(L) + 1.95, R^2 = 0.93$

H&L: theoretical slope size

Build up slope models below

2. Investigation in Tianshui area

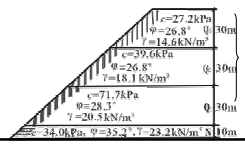
Parameters validation

Height /m	Length/m	Slope angle /degree	Factor of safety
90.0	140.3	32.7	1.37
80.0	111.6	35.6	1.25
70.0	86.2	39.1	1.15
60.0	63.9	43.2	1.06
50.0	44.9	48.1	1.02
40.0	29.1	54.0	0.98
30.0	16.7	60.9	0.90
20.0	7.6	69.2	1.05

Fs increasing much more than 1.0

doesn't match the critical slope Fs=1.0

Inverse analysis of the shear strength parameters

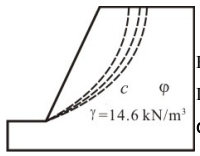


Loess stratum & Parameters

3. Inverse analysis

Basis of inverse analysis

$Fs(c, \varphi, \gamma)=1.0 \xrightarrow{\gamma \text{ by testing}} Fs(c, \varphi)=1.0$

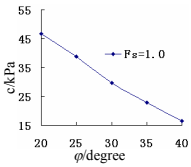


H=30.0m

L=16.7m

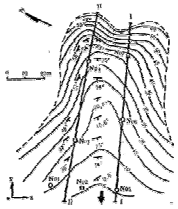
α=60.9°

Section of a homogeneous critical slope



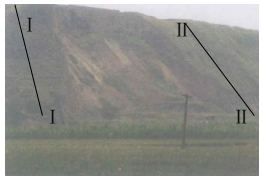
3. Inverse analysis

Similar sections

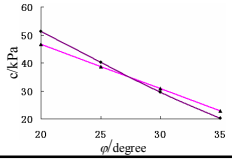


Two sections of the landslide/slopes

Similar lithology , groundwater , developmental status, landform,height&length etc.

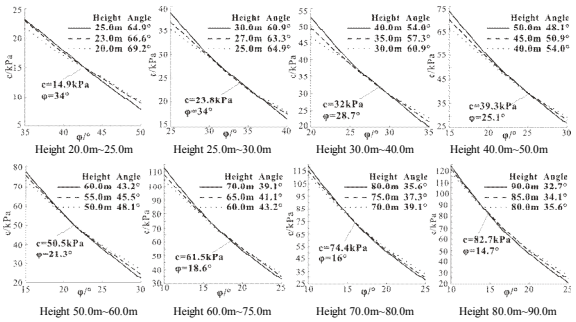


Principal sections of different landslides /slopes

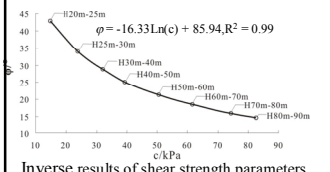


3. Inverse analysis

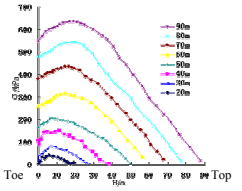
Simultaneous sections of similar critical slopes



4. Results validation and discussion

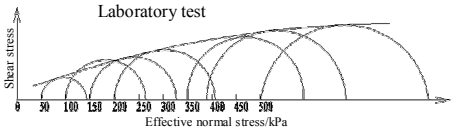


Inverse results of shear strength parameters



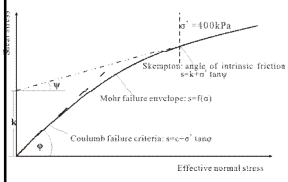
Normal stress on sliding surface

Laboratory test

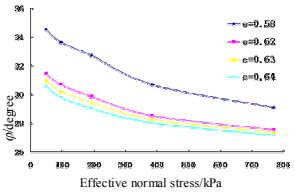


4. Results validation and discussion

Skempton: angle of intrinsic friction



Direct shear tests on standard Ottawa Sand



Thanks for your attention!